Chapter 1: Baseline Projections of New Facilities

INTRODUCTION

Chapter Contents

Facilities regulated under the final § 316(b) New Facility Rule are new greenfield and stand alone electric generators and manufacturing facilities that operate a new cooling water intake structure (CWIS) (or a CWIS whose design capacity is increased), require a National Pollutant Discharge Elimination System (NPDES) permit, have a design intake flow of equal to or greater than two million gallons per day (MGD), and use at least 25 percent of their intake water for cooling purposes. The overall costs and economic impacts of the final rule depend on the number of new facilities subject to the rule and on the planned characteristics (i.e., construction, design, location, and capacity) of their CWISs. The projection of the number and characteristics of new facilities represents baseline conditions in the absence of the rule and identifies the facilities that will be subject to the final § 316(b) New Facility Rule.

EPA did not consider the oil and gas industry in the Phase I 316(b) rulemaking for new facilities. The Phase I proposal and its record included no analysis of issues associated with offshore and coastal oil and gas extraction facilities that could significantly increase the costs and economic impacts and affect the technical feasibility of complying with the proposed requirements for land-based industrial operations. Additionally, EPA believes it is not appropriate to include these facilities in the Phase II regulations scheduled for proposal in February 2002; the Phase II regulations are intended to address the largest existing facilities in the steam-electric generating industry. During Phase III, EPA will address cooling water intake structures at existing facilities in a variety of industry sectors. Therefore, EPA believes it is most appropriate to defer rulemaking for offshore and coastal [oil and gas] extraction facilities to Phase III. For further discussion, see Chapter 5: Industry Profile - Oil and Gas Extraction Industry.

This chapter provides a summary EPA's forecasts for the number of new electric generators and manufacturing facilities subject to the final § 316(b) New Facility Rule that will begin operating between 2001 and 2020. The chapter consists of four sections. The first three sections address the forecasts of new facilities and the final section presents a profile of the electricity generation industry. Section 1.1 presents the estimates for the number and characteristics of new electric generating facilities. Section 1.2 presents the estimates for the number of new manufacturing facilities. Section 1.3 summarizes the results of the new baseline projections of facilities. For detailed discussion of the methodology behind the forecasts consult *Chapter 5 of the Economic Analysis*.

1.1 NEW ELECTRIC GENERATORS

EPA estimates that 83 new electric generators subject to the final § 316(b) New Facility Rule will begin operation between 2001 and 2020. Of these, 69 are new combined-cycle facilities and 14 are new coal facilities.[1] This projection is based on a combination of national forecasts of new steam electric capacity additions and information on the characteristics of specific facilities that are planned for construction in the near future or that have been constructed in the recent past. Using these two types of information, EPA developed model facilities that provide the basis for estimating costs and economic impacts for electric generators throughout the remainder of this document. For more detailed information regarding new electric generators, see *Economic Analysis of the Final Regulations Addressing Cooling Water Intake Structures for New Facilities*.

1.1.1 Methodology

EPA used four main data sources to project the number and characteristics of new steam electric generators subject to the final rule: (1) the Energy Information Administration's (EIA) *Annual Energy Outlook 2001* (AEO2001); (2) Resource Data International's (RDI) *NEWGen Database*, (3) EPA's § 316(b) industry survey of existing facilities; and (4) EIA's Form EIA-860A and 860B databases. The following sections provide detail on each data source used in this analysis. The final subsection 5.1.1.e summarizes how EPA combined the information from the different data sources to calculate the number of new combined-cycle and coal facilities.

Annual Energy Outlook 2001

The Annual Energy Outlook (AEO) is published annually by the U.S. Department of Energy's Energy Information Administration (EIA) and presents forecasts of energy supply, demand, and prices. These forecasts are based on results generated from EIA's National Energy Modeling System (NEMS). The NEMS system generates projections based on known levels of technological capabilities, technological and demographic trends, and current laws and regulations. Other key assumptions are made regarding the pricing and availability of fossil fuels, levels of economic growth, and trends in energy consumption. The AEO projections are used by Federal, State, and local governments, trade associations, and other planners and decision makers in both the public and private sectors. EPA used the most recent forecast of capacity additions between 2001 and 2020 (presented in the AEO2001) to estimate the number of new combined-cycle and coal-fired steam electric plants.

The AEO2001 presents forecasts of both planned and unplanned capacity additions between 2001 and 2020 for eight facility types (coal steam, other fossil steam, combined-cycle, combustion turbine/diesel, nuclear, pumped storage/other, fuel cells and renewables). EPA has determined that only facilities that employ a steam electric cycle require significant quantities of cooling water and are thus potentially affected by the final § 316(b) New Facility Rule. As a result, this analysis considers capacity additions associated with coal steam, other fossil steam, combined-cycle, and nuclear facilities only. In its Reference Case, the AEO2001 forecasts total capacity additions of 370 GW

[1]Combined-cycle facilities use an electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine to produce electricity. This process increases the efficiency of the electric generating unit.

from all facility types between 2001 and 2020.[2] Coal steam facilities account for 22 GW, or 6 percent of the total forecast, and combined-cycle facilities account for 204 GW, or 55 percent. The remaining capacity additions, 39 percent of the total, come from non-steam facility types. Based on all available data in the rulemaking record, EPA projects no new additions for nuclear and other fossil steam capacity.

NEWGen Database

The NEWGen database is created and regularly updated by Resource Data International's (RDI) Energy Industry Consulting Practice. The database provides detailed facility-level data on electric generation projects, including new (greenfield and stand alone) facilities and additions and modifications to existing facilities, proposed over the next several years. Information in the NEWGen database includes: generating technology, fuel type, generation capacity, owner and holding company, electric interconnection, project status, on-line dates, and other operational details. The majority of the information contained in this database is obtained from trade journals, developers, local authorities, siting boards, and state environmental agencies.

EPA used the February 2001 version of the NEWGen database to develop model facilities for the economic analysis of electric generators. Specifically, the database was used to:

- calculate the percentage of total combined-cycle capacity additions derived from new (greenfield and stand alone) facilities;
- calculate the percentage of total coal capacity additions derived from new (greenfield and stand alone) facilities;
- estimate the in-scope percentage of new combined-cycle facilities; and
- determine the technical, operational, and ownership characteristics of new in-scope combined-cycle facilities.

§ 316(b) Industry Survey of Existing Facilities

Because the NEWGen database discussed in the previous section contained information on only 16 new (greenfield and stand alone) coal facilities, EPA believes that information from EPA's § 316(b) industry survey of existing facilities (*Industry Screener Questionnaire: Phase I Cooling Water Intake Structures*, *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures*, and *Industry Short Technical Questionnaire: Phase II Cooling Water Intake Structures*) was more reliable for estimating characteristics of new coal facilities projected over the 2001-2020 analysis period because it included far more plants over a longer time period.

All three survey instruments requested technical information, including the facility's in scope status, cooling system type, intake flow, and source water body. In addition, the screener questionnaire and the detailed questionnaire also requested economic and financial information. For more information on the three survey instruments, see ICR No. 1973.02.

[2]Among other model parameters, the AEO2001 Reference Case assumes economic growth of 3 percent and electricity demand growth of 1.8 percent.

EPA used the following survey data on coal plants constructed during the past 20 years to project the number and characteristics of new (greenfield and stand alone) coal facilities: in-scope status, waterbody type, and cooling system type.[3]

In developing model coal facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a recirculating system with a cooling lake or pond.

EIA Databases

In addition to the § 316(b) industry survey of existing facilities, EPA used two of EIA's electricity databases (Form EIA-860A, Annual Electric Generator Report – Utility; and Form EIA-860B, Annual Electric Generator Report – Nonutility; both 1998) in the analysis of projected new coal plants. EPA used these databases for three purposes:

- **Identify which of the surveyed electric generators are "coal" plants:** EPA used the prime mover and the primary energy source, reported in the EIA databases, to determine if a surveyed facility is a coal plant. Only plants that only have coal units were considered in this analysis.
- **Identify coal plants constructed during the past 20 years:** Both EIA databases request the in-service date of each unit. Of the surveyed facilities, 111 coal-fired plants began commercial operation between 1980 and 1999.
- **Determine the average size of new coal plants:** The 111 identified coal plants have an average nameplate rating of 475 MW.[4]

Summary of the Number of New Facilities

EPA estimated the number of projected new combined-cycle and coal plants using information from the four data sources described in subsections 5.1.1.a to 5.1.1.d above. EPA used the U.S. Department of Energy's estimate of new capacity additions (combined-cycle: 204 GW, coal: 22 GW) and multiplied it by the percentage of capacity additions that will be built at new facilities (combined-cycle: 88%, coal: 76%) to determine the new capacity that will be constructed at new facilities (combined-cycle: 179 GW, coal: 17 GW). EPA then divided this value by the average facility size (combined-cycle: 741 MW, coal: 475 MW) to determine the total number of potential new facilities (combined-cycle: 241, coal: 35; both in scope and out of scope of today's final rule). Finally, based on EPA's estimate of the percentage of facilities that meet the two MGD flow threshold (combined-cycle: 28.6%, coal: 40.5%), EPA estimates there will be 69 new in-scope combined-cycle facilities and 14 new coal facilities over the 2001–2020 period.

Development of Model Facilities

The final step in the baseline projection of new electric generators was the development of model facilities for the costing and economic impact analyses. This step required translating characteristics of the analyzed combined-cycle and coal facilities into characteristics of the 83 projected new facilities. The characteristics of interest are: (1) the type of water body from which the intake structure withdraws (freshwater or marine water); (2) the facility's type of

[3]Coal plants constructed during the past 20 years were identified from Forms EIA-860A and EIA-860B. See discussion in subsection 1.1.1.d below.

[4]The average capacity for in-scope coal facilities is 763 MW, while the average for out of scope coal facilities is 278 MW.

cooling system (once-through or recirculating system); and (3) the facility's steam electric generating capacity. The following two subsections discuss how EPA developed model facilities for combined-cycle and coal facilities, respectively.

1.1.2 Projected Number of New Electric Generation Facilities

Combined-Cycle Facilities

EPA's analysis projected 69 new in-scope combined-cycle facilities. Cooling water and economic characteristics of these 69 facilities were determined based on the characteristics of the 57 in-scope NEWGen facilities.[5] EPA developed six model facility types based on the 57 facilities' combinations of source water body and type of cooling system. Within each source water body/cooling system group, EPA created between one and three model facilities, depending on the number of facilities within that group and the range of their steam electric capacities.

Based on the distribution of the 57 NEWGen facilities by source water body group, cooling system type, and size group, EPA determined how many of the 69 projected new facilities are represented by each of the six model facility types. Table 1-1 below presents the six model facility types, their estimated steam electric capacity, the number of NEWGen facilities upon which each model facility type was based, and the number of projected new facilities that belong to each type.

Table 1-1: Combined-Cycle Model Facilities

Model Facility Type	Cooling System Type	Source Water Body	Steam Electric Capacity (MW)	Number of NEWGen Facilities	Number of Projected New Facilities
CC OT/M-1	Once Through	Marine	1,031	4	5
CC R/M-1	Recirculating	Marine	489	4	5
CC R/M-2	Recirculating	Marine	1,030	1	1
CC R/FW-1	Recirculating	Freshwater	439	15	18
CC R/FW-2	Recirculating	Freshwater	699	17	21
CC R/FW-3	Recirculating	Freshwater	1,061	16	19
Total				**57**	**69**

Source: EPA Analysis, 2001.

Generally, NEWGen facilities were not always consistent in how they reported their intake flows. Some NEWGen facilities reported design flows, some reported maximum flows and some reported average flows. It was therefore necessary to estimate design flows for those facilities that had reported either maximum or average flows. To do

[5]EPA could determine the water body type for all 57 in-scope facilities but did not have information on the cooling system type for 18 facilities. Since all freshwater facilities with a known cooling system type propose to build a recirculating system, EPA assumed that the 15 freshwater facilities with an unknown cooling system type will also build a recirculating system. For marine facilities, EPA assumed that two of the three facilities with an unknown system type would build a recirculating system in the baseline while one would build a once-through system.

so, EPA assumed estimated design flows to be equivalent to maximum flows, or to three times average flows, based on the results of previous analysis of DQ combined cycle power plants. As was done for the coal-fired plants, EPA normalized estimated design flows for the NEWGen facilities by dividing by MW capacities.

Many NEWGen facilities did not report any intake flow information. EPA developed model facility flow estimates based only on those NEWGen facilities for which flows had been reported. The NEWGen facilities that did not report flows were assumed to follow the same distribution as those which had reported flow information.

EPA grouped the NEWGen facilities according to CWS type (once-through vs. recirculating) and water body type (freshwater vs. marine) to yield several baseline scenarios. The baseline scenarios for combined cycle power plants are listed in Table 1-2 below.

Table 1-2: Baseline Combined Cycle Power Plant Scenarios

Industry Category	Industry Description	Baseline Cooling Technology	Water Body Type
Combined Cycle Power Plants	Includes both Utility and Non-utility facilities	Once-through	Marine
Combined Cycle Power Plants	Includes both Utility and Non-utility facilities	Recirculating with Wet Towers	Marine
Combined Cycle Power Plants	Includes both Utility and Non-utility facilities	Recirculating with Wet Towers	Freshwater

It should be noted that a once-through, freshwater model plant was not developed because none of the NEWGen facilities fell into this baseline scenario. Within each baseline scenario, EPA developed combined cycle model facilities to represent low, medium and high MW capacity plants, using a similar methodology to that used to develop the coal-fired model facilities. Table 1-3 below presents the baseline intake and cooling flow values used in estimating the compliance costs for these model combined cycle power plants.

Table 1-3: Additional Combined Cycle Power Plant Model Facility Baseline Intake and Cooling Flow Values

Model Facility ID	Baseline Cooling Water System	Waterbody Type	Capacity (MW)	Baseline Intake Flow (MGD)	Baseline Cooling Flow (MGD)
CC OT/M-1	Once Through	Marine	1031	613	613
CC R/M-1	Recirculating	Marine	489	8	106
CC R/M-2	Recirculating	Marine	1030	18	223
CC R/FW-1	Recirculating	Freshwater	439	10	198
CC R/FW-2	Recirculating	Freshwater	699	12	230
CC R/FW-3	Recirculating	Freshwater	1061	14	283

Coal Facilities

EPA's analysis projected 14 new in-scope coal facilities. The same approach was used to assign cooling water and economic characteristics to these 14 facilities as was used for combined-cycle facilities (see discussion in the previous section). EPA determined the characteristics of the 14 projected new coal facilities based on the characteristics of the 41existing in-scope coal facilities. EPA developed eight model facility types based on the 41 facilities' source water body and their type of cooling system. Within each source water body/cooling system group, EPA created between one and three model facilities, depending on the number of facilities within that group and the range of their steam electric capacities. Based on the distribution of the 41 survey facilities by source water body group, cooling system type, and size group, EPA determined how many of the 14 projected new coal facilities are represented by each of the eight model facility types. Table 1-4 below presents the eight model facility types, their estimated steam electric capacity, the number of survey facilities upon which each model facility type was based, and the number of projected new coal facilities that are represented by each type.

Table 1-4: Coal Model Facilities

Model Facility Type	Cooling System Type	Source Water Body	Steam Electric Capacity (MW)	Number of Existing Survey Facilities	Number of Projected New Facilities
Coal R/M-1	Recirculating	Marine	812	3	1
Coal OT/FW-1	Once Through	Freshwater	63	3	1
Coal OT/FW-2	Once Through	Freshwater	515	5	1
Coal OT/FW-3	Once Through	Freshwater	3,564	1	1
Coal R/FW-1	Recirculating	Freshwater	173	10	3
Coal R/FW-2	Recirculating	Freshwater	625	7	3
Coal R/FW-3	Recirculating	Freshwater	1,564	8	3
Coal RL/FW-1	Recirculating with Lake[a]	Freshwater	660	4	1
Total				**41**	**14**

[a] For this analysis, recirculating facilities with cooling lakes are assumed to exhibit characteristics like a once-through facility.

Source: EPA Analysis, 2001.

Data taken from the surveys included both design intake flow and average intake flows, where available. With the exception of monitoring costs, all cost components used either the design intake flow or the design cooling water flow (which was estimated from the design intake flow as described in Section 2.3.5 of Chapter 2: Wet Tower Intake Flow Factors) as the input variable for deriving the cost. However, design intake flow data were not available for the SQ and screener facilities. It was therefore necessary to estimate design intake flows for these facilities. To do this, EPA calculated ratios of design to average intake flow (D/A) for those DQ facilities for which both design intake and average intake flows were available. These facilities were then grouped according to cooling water system (CWS) type (i.e., once-through vs. recirculating), and an average D/A ratio was calculated for each CWS type. This yielded average D/A ratios of 1.18 for once-through coal-fired plants and 2.94 for recirculating coal-fired plants. EPA then used these average D/A ratios to estimate design flows for those facilities for which design flows were not available (D/A ratio was multiplied by average flow to yield estimated design flow).

Where design condenser flows were available from EEI 1996 data, EPA compared the estimated design intake flows to the design condenser flows as a check of their reasonableness. For once-through facilities, the design intake flow would be expected to be similar in magnitude to the design condenser flow, while for recirculating facilities with cooling towers, the design intake flows would be expected to be only a fraction of the design condenser flows. In almost all cases, the estimated design flows were found to meet these expectations.

For a few facilities, however (notably, the facilities that had recirculating CWSs with cooling ponds), EPA found the estimated design flows (calculated using the recirculating system D/A ratio of 2.94) to be several times higher than the design condenser flows. Therefore, for these facilities, the design condenser flows were used as being more representative of the design intake flows that might be expected for such facilities (in fact, the design condenser flows were much more in line with estimated design flows calculated using the once-through D/A ratio of 1.18). See Chapter 2 for additional discussion of these recirculating facilities with cooling ponds.

Four survey facilities with estimated design flows less than the regulatory threshold of 2 million gallons per day (MGD) were then eliminated from the flow analysis as being out of scope. The regulatory threshold represents the intake flow rate at which intake systems would be required to comply with the regulation. Only those survey facilities that were in scope (i.e., met the 2 MGD regulatory threshold) were included in the analysis to develop the model facilities.

EPA then normalized the design flows for the in-scope facilities by dividing the design flow for each facility by the corresponding MW capacity for that facility to yield a ratio of design flow to MW capacity (MGD/MW). This was necessary in order to apply the flow values for plants with a range of MW capacities to average capacity model plants.

EPA then grouped the surveyed facilities according to CWS type and water body type to yield several baseline scenarios. The various water body types were divided into two general categories: freshwater, which included facilities located on freshwater rivers, streams, lakes or reservoirs; and marine, which included facilities located on tidal rivers, estuaries and oceans. The baseline scenarios for coal-fired power plants are listed in Table 1-5 below.

Table 1-5: Baseline Coal-Fired Power Plant Scenarios

Industry Category	Industry Description	Baseline Cooling Technology	Water Body Type
Coal-fired Power Plants	Includes both Utility and Non-utility facilities	Once-through	Freshwater (includes freshwater rivers, streams, lakes, and reservoirs
Coal-fired Power Plants	Includes both Utility and Non-utility facilities	Recirculating with Wet Towers	Freshwater
Coal-fired Power Plants	Includes both Utility and Non-utility facilities	Recirculating with Wet Towers	Marine (includes tidal rivers, estuaries, and oceans)
Coal-fired Power Plants	Includes both Utility and Non-utility facilities	Recirculating with Cooling Ponds	Freshwater

It should be noted that EPA did not develop a once-through, marine baseline scenario for coal-fired power plants because none of the surveyed facilities (and therefore none of the projected new facilities) fell into this baseline scenario. It should also be noted that EPA developed a separate baseline scenario for coal-fired power plants that had recirculating CWSs with cooling ponds. The design intake flows and MGD/MW ratios for these facilities were found to be much higher than those for the coal-fired power plants that had recirculating systems with wet cooling towers–more in line with what might be expected for once-through facilities. This would not be entirely unexpected, if the reported flows for these facilities represented the flows of water withdrawn from the cooling ponds for cooling

use within the plants, rather than the flows of make-up intake water to the cooling ponds. EPA therefore decided that these recirculating plants with cooling ponds deserved to be treated as a separate baseline scenario. For purposes of cost estimation, these facilities were treated the same as once-through facilities. This represented a conservative approach since, if anything, it would tend to overestimate the size of the baseline cooling water system that would have to be replaced, as well as the corresponding compliance cost.

Within each baseline scenario, EPA ranked the survey facilities in ascending order of their MW capacities. EPA then divided the ranked survey facilities into groups to yield low, medium and high MW capacity model facilities. For baseline scenarios where only a single new facility was projected, only average MW capacities were calculated. EPA developed corresponding average MGD/MW ratios for each grouping. The low, medium and high MW capacities for each baseline scenario were then multiplied by the corresponding average MGD/MW ratios to yield normalized design flow estimates for low, medium and high MW capacity model facilities. EPA then estimated the cooling water flows for the model facilities based on the design intake flows, as described below under Chapter 2, Section 2.3.5: Wet Tower Intake Flow Factors. Table 1-6 below presents the baseline intake and cooling flow values used in estimating the compliance costs for the different model coal-fired plants.

Table 1-6: Coal-Fired Power Plant Model Facility Baseline Intake and Cooling Flow Values

Model Facility ID	Baseline Cooling Water System	Waterbody Type	Capacity (MW)	Baseline Intake Flow (MGD)	Baseline Cooling Flow (MGD)
Coal OT/FW-1	Once Through	Freshwater	63	64	64
Coal OT/FW-2	Once Through	Freshwater	515	420	420
Coal OT/FW-3	Once Through	Freshwater	3564	1550	1550
Coal R/M-1	Recirculating	Marine	812	44	547
Coal R/FW-1	Recirculating	Freshwater	173	5	103
Coal R/FW-2	Recirculating	Freshwater	625	20	405
Coal R/FW-3	Recirculating	Freshwater	1564	77	1538
Coal RL/FW-1	Recirculating with Cooling Pond	Freshwater	660	537	537

1.1.3 Summary of Forecasts for New Electric Generators

EPA estimates that a total of 276 new steam electric generators will begin operation between 2001 and 2020. Of the total number of new plants, EPA projects that 83 will be in scope of the final § 316(b) New Facility Rule. Sixty-nine are expected to be combined-cycle facilities and 14 coal-fired facilities. Table 1-7 summarizes the results of the analysis.

Table 1-7: Number of Projected New Electric Generators (2001 to 2020)

Facility Type	Total Number of New Facilities	Facilities In Scope of the Final Rule						
		Recirculating		Recirc. with Lake		Once-Through		Total
		Freshwater	Marine	Freshwater	Marine	Freshwater	Marine	
Combined-Cycle	241	58	6	0	0	0	5	69
Coal	35	9	1	1	0	3	0	14
Total	276	67	7	1	0	3	5	83

Source: EPA Analysis, 2001.

1.2 NEW MANUFACTURING FACILITIES

EPA estimates that 38 new manufacturing facilities subject to the final § 316(b) New Facility Rule will begin operation between 2001 and 2020. Of the 38 facilities, 22 are chemical facilities, ten are steel facilities, two are petroleum refineries, two are paper mills, and two are aluminum facilities. The projection is based on a combination of industry-specific forecasts and information on the characteristics of existing manufacturing facilities. For more detailed information regarding new manufacturing facilities, see *Economic Analysis of the Final Regulations Addressing Cooling Water Intake Structures for New Facilities.*

1.2.1 Methodology

EPA used several steps to estimate the number of new manufacturing facilities subject to the final rule. For each industry sector, EPA:

- identified the SIC codes with potential new in-scope facilities;
- obtained industry growth forecasts;
- determined the share of growth from new (greenfield and stand alone) facilities;
- projected the number of new facilities;
- determined cooling water characteristics of existing facilities; and
- developed model facilities.

The remainder of this section briefly outlines each of these six steps. The following Section 5.2.2 describes the baseline projections of new manufacturing facilities for each of the five industry sectors.[6]

SIC codes with potential new in-scope facilities

EPA used results from the § 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to identify the SIC codes within each of the five industry sectors that are likely to have one or more new (greenfield

[6]This analysis divides the Primary Metals sector (SIC 33) into two subsectors: steel (SIC 331) and aluminum (SIC 333/335). Section 5.2.2 therefore discusses five separate sectors, not four.

and stand alone) facilities subject to the final § 316(b) New Facility Rule. SIC codes that were included in this analysis are those that, based on the Detailed Industry Questionnaire, have at least one existing facility that meets the in-scope criteria of the final rule. Facilities meet the in-scope criteria of the final rule if they:

- use a CWIS to withdraw from a water of the U.S.;
- hold an NPDES permit;
- withdraw at least two million gallons per day (MGD); and
- use 25 percent or more of their intake flow for cooling purposes.[7]

For each SIC code with at least one in-scope survey respondent, EPA estimated the total number of facilities in the SIC code (based on the sample weighted estimate from EPA's § 316(b) industry survey of existing facilities), the number of in-scope survey respondents, and the in-scope percentage.

Industry growth forecasts

Forecasts of the number of new (greenfield and stand alone) facilities that will be built in the various industrial sectors are generally not available over the 20-year time period required for this analysis. Projected growth rates for value of shipments in each industry were used to project future growth in capacity. A number of sources provided forecasts, including the annual *U.S. Industry Trade & Industry Outlook (2000),* the *Assumptions to the Annual Energy Outlook 2001*, and other sources specific to each industry. EPA assumed that the growth in capacity will equal growth in the value of shipments, except where industry-specific information supported alternative assumptions.

Share of growth from new facilities

There are three possible sources of industry growth: (1) construction of new (greenfield and stand alone) facilities; (2) higher or more efficient utilization of existing capacity; and (3) capacity expansions at existing facilities. Where available, information from industry sources provided the basis for estimating the potential for construction of new facilities. Where this information was not available, EPA assumed as a default that 50 percent of the projected growth in capacity will be attributed to new facilities. This assumption likely overstates the actual number of new (greenfield and stand alone) facilities that will be constructed.

Projected number of new facilities

EPA projected the number of new facilities in each SIC code by multiplying the total number of existing facilities by the forecasted 10-year growth rate for that SIC code. The resulting value was then multiplied by the share of growth from new facilities to derive the total number of new facilities over ten years. However, not all of the projected new facilities will be subject to requirements of the final § 316(b) New Facility Rule. Information on the likely water use characteristics of new facilities that will determine their in-scope status under the final rule is generally not available for future manufacturing facilities. EPA estimated that the characteristics of new facilities will be similar to the characteristics of existing survey respondents (i.e., the percentage of new facilities subject to the final rule would be the same as the percentage of existing facilities that meet the rule's in-scope criteria). EPA

[7]For convenience, existing facilities that meet the criteria of the final § 316(b) New Facility Rule are referred to as "existing in-scope facilities" or "in-scope survey respondents." As existing facilities, they will not in fact be subject to the rule. However, they would be subject to the final § 316(b) New Facility Rule if they were *new* facilities.

then calculated the number of new *in-scope* facilities by multiplying the 10-year forecast of new facilities by the in-scope percentage of existing facilities. To derive the 20-year estimate, both the estimated total number of new facilities and the estimated number of new in-scope facilities were doubled. This approach most likely overstates the number of new facilities that will incur regulatory costs, because new facilities may be more likely than existing ones to recycle water and use cooling water sources other than a water of the U.S.

Cooling water characteristics of existing in- scope facilities

EPA used information from EPA's § 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to determine the characteristics of the in-scope survey respondents. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information. Cooling water characteristics of interest to the analysis are the facility's baseline cooling system type (i.e., once-through or recirculating system) and its cooling water source (i.e., freshwater or marine water). In addition, the facility's design intake flow was used in the costing analysis.

Development of model facilities

The final step in the baseline projection of new manufacturing facilities was the development of model facilities for the costing and economic impact analyses. This step required translating characteristics of the existing in-scope facilities into characteristics of the projected new facilities. Again, the characteristics of interest are: (1) the facility's type of cooling system in the baseline (once-through or recirculating system) and (2) the type of water body from which the intake structure withdraws (freshwater or marine water). EPA developed one model facility for each cooling system/water body combination within each 4-digit SIC code. Based on the distribution of the in-scope survey respondents by cooling system type and source water body, EPA assigned the projected new in-scope facilities to model facility types.

EPA developed model manufacturing facilities using DQ data for 178 manufacturing facilities, regardless of their year of construction. Because the DQ manufacturing facilities represent only a sampling of the total population of manufacturing facilities, EPA used survey weights in developing flow estimates for these model facilities.

EPA first sorted the DQ manufacturing facilities according to their 4-digit SIC Codes, and then according to CWS type (once-through vs. recirculating) and water body type (freshwater vs. marine) to yield one or more baseline scenarios within each 4-digit SIC Code. Many of the DQ manufacturing facilities were found to use mixed once-through and recirculating CWSs. For purposes of cost estimation, EPA treated these facilities the same as once-through CWSs. This represented a conservative approach since, if anything, it would tend to overestimate the size of the baseline CWS that would have to be replaced, and thus overestimate the corresponding compliance costs.

Eighteen survey facilities with estimated design flows less than the regulatory threshold of 2 million gallons per day (MGD) were then eliminated from the flow analysis as being out of scope. The regulatory threshold represents the intake flow rate at which intake systems would be required to comply with the regulation. Only those survey facilities that were in scope (i.e., met the 2 MGD regulatory threshold) were included in the analysis to develop the model facilities.

The baseline scenarios for manufacturing facilities are listed in Table 1-8 below.

Table 1-8: Baseline Manufacturing Facility Scenarios

Industry Category	Industry Description	Baseline Cooling Technology	Water Body Type
SIC 2621	Paper and Allied Products - Paper Mills	Once Through	Freshwater
SIC 2812	Chemical and Allied Products - Alkalies and Chlorines	Once Through	Marine
SIC 2812	Chemical and Allied Products - Alkalies and Chlorines	Once Through	Freshwater
SIC 2812	Chemical and Allied Products - Alkalies and Chlorines	Reuse/Recycle	Freshwater
SIC 2819	Chemicals and Allied Products - Industrial Inorganic Chemicals, Not Elsewhere Classified (NEC)	Once Through	Freshwater
SIC 2819	Chemicals and Allied Products - Industrial Inorganic Chemicals, NEC	Reuse/Recycle	Freshwater
SIC 2819	Chemicals and Allied Products - Industrial Inorganic Chemicals, NEC	Once Through	Marine
SIC 2821	Chemicals and Allied Products - Plastics Materials and Synthetic Resins	Once Through	Marine
SIC 2821	Chemicals and Allied Products - Plastics Materials and Synthetic Resins	Once Through	Freshwater
SIC 2821	Chemicals and Allied Products - Plastics Materials and Synthetic Resins	Reuse/Recycle	Freshwater
SIC 2834	Chemicals and Allied Products - Pharmaceuticals	Once Through	Freshwater
SIC 2834	Chemicals and Allied Products - Pharmaceuticals	Reuse/Recycle	Freshwater
SIC 2869	Chemicals and Allied Products - Industrial Organic Chemicals, NEC	Once Through	Marine
SIC 2869	Chemicals and Allied Products - Industrial Organic Chemicals, NEC	Once Through	Freshwater
SIC 2869	Chemicals and Allied Products - Industrial Organic Chemicals, NEC	Reuse/Recycle	Freshwater
SIC 2873	Chemicals and Allied Products - Nitrogenous Fertilizers	Once Through	Freshwater
SIC 2873	Chemicals and Allied Products - Nitrogenous Fertilizers	Reuse/Recycle	Freshwater
SIC 2911	Petroleum Refining	Reuse/Recycle	Freshwater
SIC 2911	Petroleum Refining	Once Through	Freshwater
SIC 3312	Primary Metal Industries - Steel Works, Blast Furnaces and Rolling	Once Through	Freshwater

Table 1-8: Baseline Manufacturing Facility Scenarios

Industry Category	Industry Description	Baseline Cooling Technology	Water Body Type
SIC 3312	Primary Metal Industries - Steel Works, Blast Furnaces and Rolling	Reuse/Recycle	Freshwater
SIC 3316	Primary Metal Industries - Cold-Rolled Steel Sheet, Strip and Bars	Once Through	Freshwater
SIC 3316	Primary Metal Industries - Cold-Rolled Steel Sheet, Strip and Bars	Reuse/Recycle	Freshwater
SIC 3317	Primary Metal Industries - Steel Pipe and Tubes	Once Through	Freshwater
SIC 3317	Primary Metal Industries - Steel Pipe and Tubes	Reuse/Recycle	Freshwater
SIC 3353	Primary Metal Industries - Aluminum Sheet, Plate and Foils	Once Through	Freshwater
SIC 3353	Primary Metal Industries - Aluminum Sheet, Plate and Foils	Reuse/Recycle	Freshwater

Within each baseline scenario, EPA ranked the DQ facilities in ascending order based on their design intake flows. Design intake flows were not available for two of the DQ manufacturing facilities. However, average intake flows were available for these facilities. EPA estimated design intake flows for these facilities by multiplying their average intake flows by the average ratio of design intake to average intake flow for the other facilities within their baseline scenarios.

EPA then divided the DQ facilities within each baseline scenario into thirds. EPA then calculated weighted average design intake flows for the middle third to yield design flow values for medium-sized (as reflected by design flow) manufacturing facilities; the lower and upper thirds were excluding from the averaging to minimize the effects of unusually small or unusually large facilities on the average. Table 1-9 below presents the baseline intake and cooling flow values used in estimating the compliance costs for the different model manufacturing facilities.

Table 1-9: Manufacturing Model Facility Baseline Intake and Cooling Flow Values

Model Facility ID	Baseline Cooling Water System	Waterbody Type	Baseline Intake Flow (MGD)	Baseline Cooling Flow (MGD)
MAN OT/FW-2621	Once Through	Freshwater	24	24
MAN OT/M-2812	Once Through	Marine	94	94
MAN OT/FW-2812	Once Through	Freshwater	265	265
MAN R/FW-2812	Reuse/Recycle	Freshwater	6	60
MAN OT/FW-2819	Once Through	Freshwater	19	19

Table 1-9: Manufacturing Model Facility Baseline Intake and Cooling Flow Values

Model Facility ID	Baseline Cooling Water System	Waterbody Type	Baseline Intake Flow (MGD)	Baseline Cooling Flow (MGD)
MAN R/FW-2819	Reuse/Recycle	Freshwater	2	20
MAN OT/M-2819	Once Through	Marine	27	27
MAN OT/FW-2821	Once Through	Freshwater	78	78
MAN R/FW-2821	Reuse/Recycle	Freshwater	14	140
MAN OT/M-2821	Once Through	Marine	30	30
MAN OT/FW-2834	Once Through	Freshwater	18	18
MAN R/FW-2834	Reuse/Recycle	Freshwater	2	20
MAN OT/FW-2869	Once Through	Freshwater	40	40
MAN OT/M-2869	Once Through	Marine	26	26
MAN R/FW-2869	Reuse/Recycle	Freshwater	4	40
MAN OT/FW-2873	Once Through	Freshwater	33	33
MAN R/FW-2873	Reuse/Recycle	Freshwater	30	300
MAN R/FW-2911	Reuse/Recycle	Freshwater	8	80
MAN OT/FW-2911	Once Through	Freshwater	105	105
MAN OT/FW-3312	Once Through	Freshwater	124	124
MAN R/FW-3312	Reuse/Recycle	Freshwater	85	850
MAN OT/FW-3316	Once Through	Freshwater	23	23
MAN R/FW-3316	Reuse/Recycle	Freshwater	12	120
MAN OT/FW-3317	Once Through	Freshwater	39	39
MAN R/FW-3317	Reuse/Recycle	Freshwater	4	40
MAN OT/FW-3353	Once Through	Freshwater	35	35
MAN R/FW-3353	Reuse/Recycle	Freshwater	6	60

1.2.2 Projected Number of New Manufacturing Facilities

Paper and Allied Products (SIC 26)

This analysis assumes that two new in-scope paper mills (SIC code 2621) will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 88 percent of all existing in-scope paper mills operate a once-through system and withdraw from a freshwater body. EPA therefore assumed that both projected new in-scope paper mills will be freshwater facilities with a once-through system. Table 1-10 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 1-10: SIC 26 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of In-Scope Survey Respondents	Number of New In-Scope Facilities
MAN OT/F-2621	2621	Once-Through	Freshwater	47	2

Source: EPA Analysis.

Chemicals Manufacturing (SIC 28)

EPA projected that 22 new in-scope chemical facilities will begin operation during the next 20 years. Based on the distribution of the in-scope survey respondents across water body and cooling system types, EPA assigned the 22 new facilities to 11 different model facility types, by SIC code:

- ***SIC code 2812:*** EPA projects that two new in-scope facilities will begin operation during the next 20 years. The distribution of existing in-scope facilities across water body and cooling system types showed that 36 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 36 percent operate a once-through system and withdraw from a marine body. EPA therefore projected one new once-through/freshwater facility and new once-through system/marine facility.
- ***SIC code 2819:*** Four new industrial inorganic chemicals, not elsewhere classified are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 47 percent of the existing in-scope facilities operate a once-through system and withdraw from a freshwater body, 39 percent operate a once-through system and withdraw from a marine water body, and 14 percent operate a recirculating system and withdraw from a freshwater body. EPA therefore projected two new once-through/freshwater facilities and two new once-through/marine facilities.
- ***SIC code 2821:*** EPA projects that four new in-scope facilities will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that all existing in-scope plastics material and synthetic resins, and nonvulcanizable elastomer facilities operate a once-through system and withdraw from a freshwater body. EPA therefore assumed that all four projected new in-scope facilities will be freshwater facilities with a once-through system.
- ***SIC code 2834:*** EPA projects that two new in-scope facilities will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that all existing in-scope pharmaceutical preparation facilities operate a once-through system and withdraw from a

freshwater body. EPA therefore assumed that both projected new in-scope facilities will be freshwater facilities with a once-through system.

- ***SIC code 2869:*** Eight new facilities in the Industrial Organic Chemical, Not Elsewhere Classified sector are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 89 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 11 percent operate a recirculating system and withdraw from a freshwater body. Therefore EPA projected that seven new once-through/freshwater facilities and one new recirculating/freshwater facility.
- ***SIC code 2873:*** EPA projected that two new in-scope nitrogenous fertilizer facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore projected one new recirculating/freshwater facility and one new once-through/freshwater facility.

Table 1-11 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 1-11: SIC 28 Model Facilities

Model Facility Type	SIC	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/M-2812	2812	Once-Through	Marine	6	1
MAN RE/F-2812	2812	Once-Through	Freshwater	6	1
MAN OT/M-2819	2819	Once-Through	Marine	13	2
MAN OT/F-2819	2819	Once-Through	Freshwater	16	2
MAN OT/F-2821	2821	Once-Through	Freshwater	10	4
MAN OT/F-2834	2834	Once-Through	Freshwater	4	2
MAN OT/F-2869	2869	Once-Through	Freshwater	35	7
MAN RE/F-2869	2869	Recirculating	Freshwater	4	1
MAN OT/F-2873	2873	Once-Through	Freshwater	4	1
MAN RE/F-2873	2873	Recirculating	Freshwater	4	1
Total				**102**	**22**

Source: EPA Analysis.

Petroleum and Coal Products (SIC 29)

EPA projected that two new in-scope petroleum refineries (SIC code 2911) will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 52 percent of the existing petroleum refineries operate a recirculating system and withdraw from a freshwater body and 30 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics. Table 1-12 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 1-12: SIC 29 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-2911	2911	Once Through	Freshwater	9	1
MAN RE/F-2911	2911	Recirculating	Freshwater	15	1
Total				**24**	**2**

Source: EPA Analysis.

Steel (SIC 331)

EPA projected that 10 new in-scope steel facilities will begin operation during the next 20 years. Based on the distribution of the in-scope survey respondents across water body and cooling system types, EPA assigned the 10 new facilities to six different model facility types, by SIC code:

- ***SIC code 3312:*** Six steel mills are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 91 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and nine percent operate a recirculating system and withdraw from a freshwater body. Therefore EPA projected that five new once-through/freshwater facilities and one recirculating/freshwater facility.
- ***SIC code 3316:*** EPA projected that two new in-scope cold-rolled steel sheet, strip, and bar facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 67 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 33 percent operate a recirculating system and withdraw from a freshwater body. EPA therefore projected one once-through/freshwater and one recirculating/freshwater facility.
- ***SIC code 3317:*** EPA projected that two new in-scope steel pipe and tube facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics.

Table 1-13 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 1-13: SIC 331 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-3312	3312	Once-Through	Freshwater	32	5
MAN RE/F-3312	3312	Recirculating	Freshwater	3	1
MAN OT/F-3316	3316	Once-Through	Freshwater	6	1
MAN RE/F-3316	3316	Recirculating	Freshwater	3	1
MAN OT/F-3317	3317	Once-Through	Freshwater	3	1
MAN RE/F-3317	3317	Recirculating	Freshwater	3	1
Total				**50**	**10**

Source: EPA Analysis.

Aluminum (SIC 333/335)

EPA projected that two new in-scope aluminum facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing aluminum facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics. Table 1-14 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 1-14: SIC 3353 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-3353	3353	Once-Through	Freshwater	3	1
MAN RE/F-3353	3353	Recirculating	Freshwater	3	1
Total				**6**	**2**

Source: EPA Analysis.

1.2.3 Summary of Forecasts for New Manufacturing Facilities

EPA estimates that a total of 380 new manufacturing facilities will begin operation between 2001 and 2020. Thirty-eight of these are expected to be in scope of the final § 316(b) New Facility Rule. Of the 38 facilities, 22 are chemical facilities, ten are steel facilities, two are petroleum refineries, two are paper mills, and two are aluminum facilities. Table 1-15 summarizes the results of the analysis.

Table 1-15: Number of Projected New Manufacturers (2001 to 2020)

Facility Type	Total Number of New Facilities	Facilities In Scope of the Final Rule				
		Recirculating		Once-Through		Total
		Freshwater	Marine	Freshwater	Marine	
Paper and Allied Products (SIC 26)	2	0	0	2	0	2
Chemicals and Allied Products (SIC 28)	282	2	0	17	3	22
Petroleum Refining And Related Industries (SIC 29)	2	1	0	1	0	2
Blast Furnaces and Basic Steel Products (SIC 331)	78	3	0	7	0	10
Aluminum Sheet, Plate, and Foil (SIC 3353)	16	1	0	1	0	2
Total	**380**	**7**	**0**	**28**	**3**	**38**

Source: EPA Analysis, 2001.

1.3 Summary of Baseline Projections

EPA estimates that over the next 20 years a total of 656 new greenfield and stand alone facilities will be built in the industry sectors analyzed for this final regulation. Two hundred and seventy-six of these new facilities will be steam electric generating facilities and 380 will be manufacturing facilities. As Table 1-16 shows, only 121 of the 656 new facilities are projected to be in scope of the final § 316(b) New Facility Rule, including 83 electric generators, 22 chemical facilities, 12 primary metals facilities, two new pulp and paper, and two petroleum facilities. For more detailed information, see *Economic Analysis of the Final Regulations Addressing Cooling Water Intake Structures for New Facilities*.

Table 1-16: Projected Number of New In Scope Facilities (2001 to 2020)

SIC	SIC Description	Projected Number of New Facilities	
		Total	In-Scope
	Electric Generators		
SIC 49	Electric Generators	276	83
	Manufacturing Facilities		
SIC 26	Paper and Allied Products	2	2
SIC 28	Chemicals and Allied Products	282	22
SIC 29	Petroleum Refining And Related Industries	2	2
SIC 33	Primary Metals Industries		
SIC 331	Blast Furnaces and Basic Steel Products	78	10
SIC 333 SIC 335	Primary Aluminum, Aluminum Rolling, and Drawing and Other Nonferrous Metals	16	2
Total Manufacturing		*380*	*38*
Total		**656**	**121**

Source: EPA Analysis, 2001.

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